GRICULTURAL NEWS LETTER

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This publication gives information on new developments of interest to agriculture on laboratory and field investigations of the du Pont Company and its subsidiary companies.

In addition to reporting results of the investigations of the Company and its subsidiaries, published reports and direct contributions of investigators of agricultural experiment stations and other institutions are given dealing with the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

Vol. 7 - No. 2 February 1939

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Agricultural News Letter (du Pont)
Vol. 7, No. 2, February, 1939

TIME AND RATE OF ABSORPTION OF PLANT FOOD BY TOMATOES ASCERTAINED IN EXPERIMENTS CONDUCTED IN NEW JERSEY

EDITOR'S NOTE:- The discussion of time and rate of absorption of plant foods by potatoes, based on work done by R. L. Carolus in Virginia, was reviewed in the December issue of "Agricultural News Letter." Further information on this subject as it relates to tomatoes is offered in the following review of work conducted by Dr. Jackson B. Hester in New Jersey.

By F. W. Parker, Agronomist,
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Wilmington, Delaware

Two highly important questions involved in crop fertilization are (1) how much plant food do plants absorb during various periods of growth; and (2) how may these plant foods best be supplied to the plant when it needs them?

Experiments designed to answer these questions for the tomato plant were conducted by Dr. J. B. Hester, Soil Technologist, Campbell Soup Company, Department of Agricultural Research, Riverton, N. J., and reported in "American Fertilizer," Vol. 89, No. 10, November, 1938. He made chemical analyses of tomato plants at the following stages of growth: When the plants were ready for transplanting; and at monthly intervals thereafter for three months, to maturity.

The tomatoes were grown on a Sassafras sandy loam in a high state of fertility, and were fertilized with commercial fertilizer supplying 80 pounds of nitrogen per acre, 120 pounds of phosphoric acid, and 130 pounds of potash, as well as an estimated 160 pounds of calcium (CaO) and 40 pounds of magnesia (MgO). The final harvested yield was slightly over seven tons per acre, but a considerable portion of the crop was lost, due to poor harvesting conditions.

Dry weight of the 3,000 plants required for an acre was about 9 pounds at transplanting; at the end of the first month about 75 pounds; and at the end of the second month about 1,000 pounds. When the plants began to bear fruit, or at the peak of growth, the weight of fruit was about 1,440 pounds of dry matter and 2,100 pounds of vegetation.

The following table shows the amount and percentage of plant food absorbed by the tomato plants during each of the three months of the growing season. The data are also used as the basis of the comparisons in the accompanying figure.

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	First Month		Second Month		Third Month		Total*
	Pounds per Acre	Per Cent of Total	Pounds per Acre	Per Cent of Total	Pounds per Acre	Per Cent of Total	Pounds per Acre
Nitrogen (N)	2.8	3	27.1	28	68.1	69	98.7
Phosphorus (P_2O_5)	0.8	3	10.1	35	17.8	62	28.8
Potassium (K_2O)	4.4	2	51.9	30	117.0	68	173.9
Calcium (CaO)	2.9	3	37.1	35	66.4	62	106.8
Magnesium (MgO)	0.6	3	4.1	20	15.7	77	20.5
Total	11.5	3	130.3	30	285.0	67	428.7

* At maturity

First Month: During the first month following transplanting, the tomatoes made only 2 per cent of their total growth. Likewise, they absorbed only a very small portion of their total plant food. In the 30-day period they absorbed 2.8 pounds of nitrogen, 0.8 pounds of phosphorus, 4.4 pounds of potassium, 2.9 pounds of calcium, and 0.6 pounds of magnesium. These figures represent approximately 3 per cent of the total nitrogen, phosphorus, calcium, and magnesium used, and only about 2 per cent of the potassium. They also represent 2 per cent of the plant food applied in the fertilizer.

Second Month: The tomato crop made 26 per cent of its growth during the second month. It absorbed approximately 30 per cent of its plant food during the same period. The actual percentage absorbed varied from 20 per cent of the magnesium to 35 per cent of the phosphorus and calcium. The crop absorbed 130 pounds of plant food, which is 25 per cent of the quantity applied in the fertilizer. The percentage of applied plant food absorbed during the first two months varied from 9 per cent of the phosphorus to 37 per cent of the nitrogen and 43 per cent of the potassium.

Third Month: In the last month of this growing period, the tomato crop made 72 per cent of its total growth, and absorbed approximately two-thirds of its plant food. It is, therefore, evident that it was during the third month of growth that the crop was utilizing most of the plant-food applied in the fertilizer. In this period, some of the plant-food elements were being translocated to the fruit while others remained for the most part in the vegetative part of the plant. At maturity, 60 per cent of the nitrogen and nearly one-half of the potassium and phosphorus were in the fruit. Most of the calcium and magnesium remained in the vegetation. Hester points out that the vegetation contains large quantities of calcium, magnesium, potash, and nitrogen which are returned to the soil. These may be protected from leaching and erosion by use of a catch crop, such as rye.

Relation of Plant Food Absorption to Fertilization

Hester secured the foregoing data so that it might be used in the development of better fertilizers and methods of fertilization. Having determined the

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time and rate of absorption of plant-food, the following question arises:

How can these plant-food elements be most economically supplied to the crop when it needs them? This depends for the most part on (a) the availability of the plant food in the fertilizer, (b) fertilizer-soil reactions which increase or decrease the availability of the fertilizer, and (c) leaching of the plant food in wet seasons.

Phosphoric acid is applied in an available form. It reacts with the soil with great rapidity, so there is almost no movement in the soil and top-dressing is impractical. This reaction, phosphate fixation, reduces the availability of the phosphate to the plant. In view of these facts, phosphates are best applied at planting. Band or localized application tends to reduce fixation, thereby keeping more of the phosphate available to the crop in the latter stages of growth.

Potash salts are, of course, completely available when applied. They react with the soil, so there is very little danger from loss by leaching. This reaction, however, does not reduce their availability. It is, therefore, generally considered advisable to apply all of the potash at planting. The application of part of the potash, however, may be deferred as a means of reducing fertilizer injury to the transplants.

Nitrogen offers the greatest problem insofar as having it available when the crop needs it, and at the same time avoiding loss by leaching. Fortunately, ammonia and urea nitrogen are available to the crop, react with the soil, and are protected from leaching in much the same manner as potash. It is only when converted to the nitrate form that nitrogen is mobile in the soil and is, therefore, subject to loss by leaching. More data are needed on the rate of nitrate formation in the fertilizer zone. The available data, however, indicate that nitrification proceeds rather slowly for two to four or six weeks, so that leaching losses are minimized during the period the crop is absorbing very little nitrogen. Unless leaching-resistant forms of nitrogen are used at planting, it may be advisable to divide the nitrogen application. If this is done, the second application should be made four to six weeks after transplanting.

Summary

Tomato plants grown on a Sassafras sandy loam in New Jersey, and well fertilized were analyzed at one-month intervals to determine the amounts of plant food absorbed during various periods of growth. The results may be summarized as follows:

(1) During the first month, the crop produced only 2 per cent of its final dry weight. The plants absorbed 3 per cent of the total nitrogen, phosphorus, calcium, and magnesium, and only 2 per cent of the total potassium.

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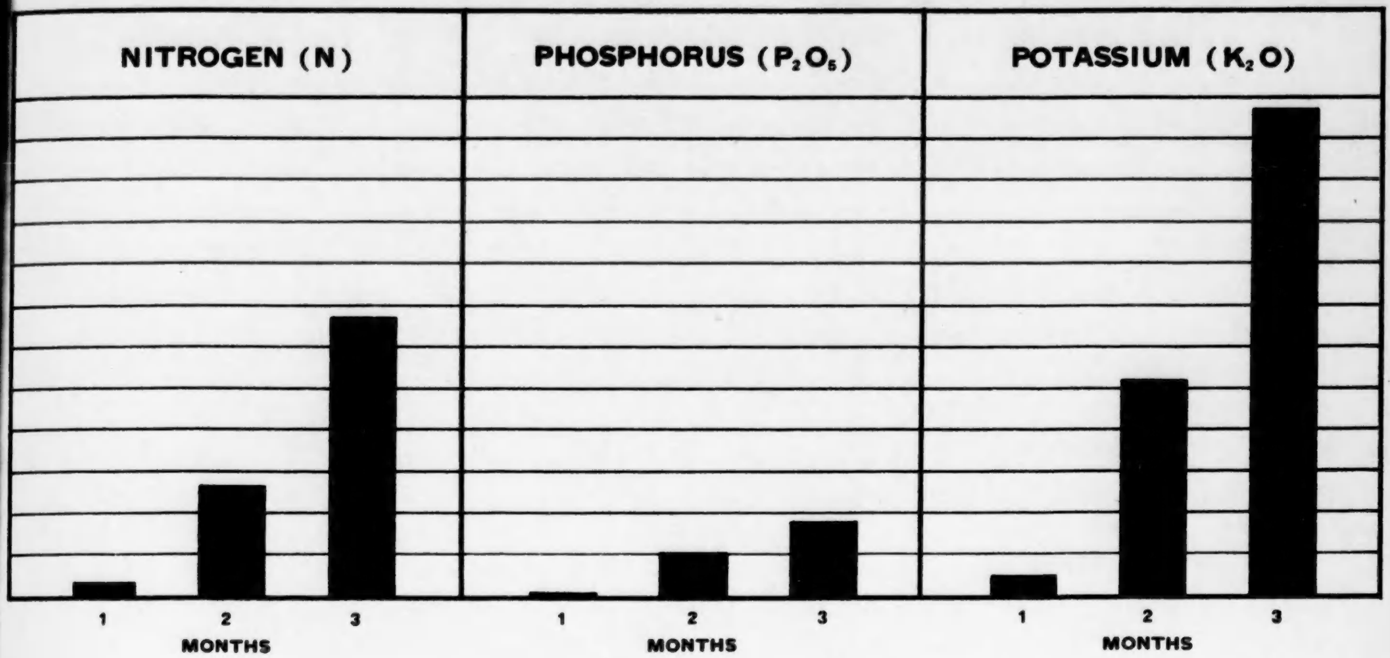
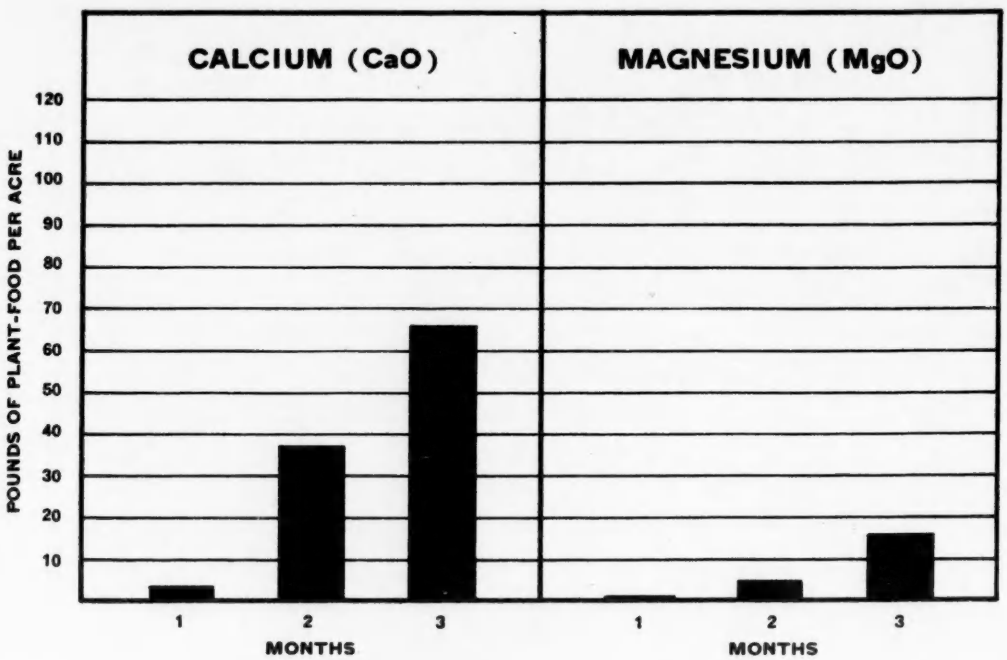
(2) As shown in the graph on the next page, absorption was much more rapid during the second month. In this period the crop produced 26 per cent of its dry weight, and absorbed approximately 30 per cent of its plant-food.

(3) In the third and final month of the growing period, the tomato crop made 72 per cent of its total growth. It also absorbed twc-thirds of its total plant-food in this period.

Rate of nitrogen and total plant-food absorption per acre increased from 0.1 and 0.4 pounds per day in the first month to 1.9 and 4.3 pounds the second month, and 2.25 and 9.5 pounds the third and final month of growth.

The relationship of these data to tomato fertilization is discussed. Consideration is given to (a) availability, (b) reactions in the soil, and (c) movement in the soil of all three commercial plant-foods.





The Amount of Plant-Food Absorbed by Tomatoes at Different Stages of Plant Growth

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VITAMIN D FOR POULTRY PRODUCED IN DU PONT LABORATORY SHOWS AS GREAT EFFICIENCY AS COD LIVER OIL IN FEEDS

EDITOR'S NOTE:- This announcement of a new source of vitamin D is certain to be of interest to technical workers in the poultry field, manufacturers of feeds, and commercial poultrymen. Complete information on the product is available through the "Cel-O-Glass" Section, E. I. du Pont de Nemours & Company, Inc., Wilmington, Delaware.

Du Pont Vitamin D, the first product for poultry, which is at least as efficient as cod liver oil is now being produced in the du Pont Biological Laboratory at New Brunswick, New Jersey. It is made by activating with ultra-violet light the animal provitamin associated with cholesterol. A powder is used for the carrier for this activated animal provitamin.

For years, poultry feed manufacturers have been accustomed to fortifying feeds with vitamin D in the form of fish liver oils, but the manufacturer frequently found it difficult to get proper distribution of the oil in the feed. This has been especially true during the winter months when the oil has a tendency to congeal on cold grain.

The use of a dry powder as a carrier for vitamin D offers a most satisfactory solution. As little as eight ounces of Du Pont Vitamin D can be perfectly dispersed in one ton of feed.

Rigid controls in the production of Du Pont Vitamin D insures a uniform, efficient product of unvarying potency. In laboratory and field tests on both chickens and turkeys, there is an accumulation of evidence indicating that birds are given adequate vitamin D protection when fed at levels lower than is recommended for fish liver oils.

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HAZARDS IN RELATION TO HOUSEHOLD FUMIGATION WITH HYDROCYANIC ACID GAS TO GUARD AGAINST

EDITOR'S NOTE:- This article serves to emphasize the fact that hydrocyanic acid should be handled only by competent operators.

Hydrocyanic acid gas was first introduced in California for the fumigation of citrus groves in 1896 by Coquillet, an investigator of the Bureau of Entomology. In 1898, it came into use for industrial and household fumigation at the suggestion of workers in the Bureau of Entomology. Its adoption, about 1912, by the United States Public Health Service for the fumigation of ships gave HCN gas even greater impetus for its use in industrial and household fumigation. Today, fumigation with HCN gas has become a science although its attendant hazards have not been fully recognized until within comparatively recent years.

Because of the hazards involved, both to operators and to occupants of buildings, the application of this gas for fumigation should be carried out only by trained men, familiar with its properties and action. This should be made a strict requirement on the part of all Pest Control Operators and others whose duties call for work in the fumigation field.

All those who work with hydrocyanic acid gas know that there are several sources of the material, and various methods of applying it. Briefly, these are: Liquid HCN which is applied from pressure cylinders from the outside of the building; liquid HCN absorbed in a porous, inert material which is applied inside the building; the powdered cyanides which are applied inside the building; and the generation methods, one of which is the pot method, applied within the building and the other, the cyanide generator by which the gas is applied from outside the building.

This discussion is to be devoted only to hazards in relation to household fumigation, a branch of the work which probably offers the greatest number of chances for serious mistakes. In dealing with this subject, consideration must be given to "Hazards to Operators," and "Hazards to Householders."

Hazards to Operators

As stated above, all fumigators should be familiar with the nature and action of hydrocyanic acid gas and every precaution should be taken to protect both the operators and occupants of the homes being fumigated. Each job should be well and critically planned and specific duties should be delegated to each man on the job. The responsibility for supervision of the entire job should be assigned to one man, from the preparation of the building until it has been

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declared safe for reoccupancy. Each assistant should know exactly his particular duty for each stage of the work. Operators who apply the fumigant, regardless of its source, are in a hazardous position until the fumigation is completed. In the course of this discussion, I will attempt to cover the principal hazards that may be encountered but it will be impossible to go into great detail in the limited space at my disposal. There are so many variables in the application of HCN gas for fumigation that it may appear as though certain features may be slighted, or even lost sight of, entirely. Keep in mind, too, that the human factor also enters into the problem and that the practices of one group may vary widely from that of another. I will not discuss the hazards in the order of the various kinds and sources of material, as they were briefly described, but will call attention to such hazards as occasion calls for the mention of the various materials.

Safety Equipment

Pest Control Operators who use the pot method should exercise special care at various steps in the procedure. Workers who handle sulphuric acid should be provided with goggles and rubber gloves to guard against burns to eyes and hands. There are several cases on record where acid has spattered into eyes, causing total blindness. Fortunately, no such accident has ever occurred among fumigators, although there is an ever-present hazard.

For handling sodium cyanide, rubber gloves, or a good grade of canvas gloves, should be worn. This is advisable to prevent contact with the skin to provide against the caustic action of the cyanide and poisoning, should there be any cuts or open abrasions on the hands. Likewise, gloves should be worn when handling the powdered forms of cyanide where those materials are likely to come into contact with the skin. The reason for this is due to the fact that these materials give off HCN gas when they react with air moisture, and accumulations of the powders on the skin may permit the absorption of gas released in this manner into the body.

Gas masks should be provided for every employee engaged in the fumigation operation. Where the gas is to be generated inside the building by any of the methods mentioned previously, all men doing the work should wear gas masks from the time the fumigation operation is started until they have left the structure. Great care should be exercised to see that masks fit properly and that the canisters are in first-class condition. Several accidents are thought to have been caused by not exercising this care. Canisters should be replaced frequently where they are subjected to continued use. Also, it has been claimed that unused canisters should not be employed if they are more than one year old. The recommendations of canister manufacturers should be closely followed on this point.

Where hydrocyanic acid gas is applied from outside the building, gas masks should be ready for emergency use at all times by fumigators on the job. A situation such as leakages at valves or connections, or a broken line may occur which requires quick action and which can only be corrected by an operator wearing a gas mask.

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Gas Absorption Through Skin

Another hazard to operators lies in the absorption of hydrocyanic acid gas through the skin. This may occur on jobs where the fumigators are required to work in an atmosphere of the gas during the fumigation operations. Liquid HCN absorbed in an inert porous material, the pot method and the powdered cyanides are all applied inside the building and fumigators are more or less subjected to the gas while working. Men, moist with perspiration, or wearing damp clothing, are subject to this hazard because the moisture will absorb the gas and the body in turn will absorb it, with an effect being quite similar to the actual breathing of the gas. There have been accidents due to both causes. I am familiar with one in which three men were overcome. They were perspiring heavily and applying absorbed liquid HCN in a building in which the temperature was over 100°. Another accident occurred where men, wearing rain soaked clothing, were applying gas within the building. The gas was absorbed in the clothing and, upon completion of the job, the men went into a dry, heated room and the heat caused the gas to evolve, overcoming several of the men. Fortunately, no fatalities occurred in either of these accidents.

Finally, the operators encounter hazards when they enter a building to ventilate it. It is still too common a practice to send men in to open up doors and windows without being protected by gas masks. It should be made a rule that all workers entering a building to ventilate it following exposure to hydrocyanic acid gas, should wear masks. After the building has been opened, no man should be permitted to venture into the building without a mask before it has aired for at least two hours. Even then, whoever enters the building should carry a gas mask for emergency use. The clean-up in the building, which is usually carried out during the ventilation period, should be followed with caution for several of the methods. In the case of the pot method, care should be exercised not to agitate the residues in the pots for frequently sufficient gas can be again generated to cause a serious accident to workers carrying the pots. Likewise, liquid HCN or the liquid HCN absorbed in porous material, and the powdered cyanides, present hazards. The first two products may be condensed to liquid, or even to a solid icy-like material, if the temperature during the exposure period has dropped considerably below the boiling point of the gas. As the temperature of the building is then increased to 80°, this liquid, or solid icy material, will volatilize and frequently give off gas in sufficient quantities to cause a serious accident. The powdered cyanides never give off all of the available HCN gas during a normal exposure period and care should be exercised in gathering it up not to breathe the fumes, or permit it to dust through the premises.

Hazards to Householders

The most serious hazards to householders occur after the fumigation and are usually due to faulty ventilation. Before the fumigation, all occupants of the home should be notified sufficiently in advance of a job so that they can make arrangements for quarters during which the house is in the hands of the Pest Control Operator. On the day of the fumigation, the operator in charge of the job should be responsible for the complete evacuation of the structure to

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be fumigated. No one but employees of the Pest Control Operator should thereafter be permitted to enter the building until it has been declared safe for reoccupancy.

After the actual fumigation operation, and when the building has been locked and properly placarded, a watchman should be stationed on the job, charged with the responsibility of preventing anyone from entering the building. Accidents have occurred from this cause despite the fact that a watchman has been present and the building has been placarded and locked. The watchman should be familiar with the nature of the work which has been done and should be acquainted with the possible use of a gas mask which he should have on hand for emergency use. The building should be kept under guard until it has been turned back to the householder. For large buildings, such as apartment houses, two or more watchmen may be required. Too little consideration is still given to the placing of watchmen on jobs by many Pest Control Operators. It should be made a part of the fumigation standard practice. Keep in mind that there are, and always will be, people who do not believe in signs such as:

DANGER!!!
THIS BUILDING IS BEING
FUMIGATED WITH HYDROCYANIC
ACID GAS
A DEADLY GAS
KEEP OUT

After a building has been opened for ventilation, the real hazard to the householder begins. The fumigator in charge of the job must be responsible until he is certain that the free space in the building and bedding, upholstered furniture, and other articles which may absorb and hold toxic concentrations of the gas for long periods, are thoroughly freed of it. His responsibility is a serious one. Bedding, upholstered furniture, and the like, should be kneaded and squeezed again and again until it is assured that they are free from gas. They should be allowed the maximum of fresh circulating air and it is often advisable to do much of the airing outdoors. Many of the fumigation accidents reported during the years past have been caused by improperly ventilated bedding.

Drops in temperature during the exposure period may also give rise to hazards to householders. When the temperature drops below the boiling point of HCN, the gas will condense on walls and other surfaces, in bedding, upholstered furniture, and other materials in such manner that ordinary ventilation will not readily clear out the gas. The premises may be aired and thought to be completely free from gas, but when the home is heated, the gas which has condensed may be given off in toxic concentrations. Even the warmth of the body is sufficient to generate toxic quantities of HCN from bedding and mattresses. A number of accidents have been caused from the body warmth of sleeping persons causing condensed, or absorbed gas, to volatilize after it was assumed that the premises were properly ventilated. Space does not permit going into detail on this subject.

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At this point I would like to discuss the practice of fumigating a single apartment with hydrocyanic acid gas. Some fumigators, in doing this type of work, order all apartments that are immediately adjacent to the one being fumigated, to be vacated. By adjacent, I refer to those apartments immediately above and below and on each side of the one which is to be treated with hydrocyanic acid gas. Occasionally, a fumigator will be found who will attempt to fumigate an apartment without ordering any near-by apartments to be vacated. Each of the practices just mentioned should never be followed. From our knowledge of the behavior of gases, there is no assurance that other inhabitants of the building will not be affected by the seepage of gas throughout the structure. Pest Control Operators should require the evacuation of an entire apartment house before undertaking the fumigation of any portion of it with hydrocyanic acid gas. Further, if household pests are present in one apartment, they are more than likely to be present in other apartments in the same building, thus making it advisable to fumigate the entire building to prevent reinfestation.

The question of how long a Pest Control Operator should hold a home when it has been given to him for a fumigation has often been raised. Because of greatly varying practices, it is difficult to lay down hard and fast rules, but certain remarks on this point may be timely. Ordinarily, homes are turned back to the householder in from 10-12 hours and, occasionally, in as short a time as 8 hours. It is rarely possible to fumigate and ventilate a building properly, even within a 12 hour period. Pest Control Operators should have a home at least 24 hours in order to be reasonably certain that a thorough job has been done. Many operators now insist on the 24 hour period. I have even seen homes that could not be reoccupied within 36 hours from the time they were opened for ventilation. This may be explained by the fact that outdoor temperature, humid or rainy weather, and other climatic conditions, together with the dosage of gas used in the fumigation, may require more time in which to bring about proper ventilation.

As yet, no one has ever gone on record as to what constitutes an entirely safe concentration of HCN gas for humans. It is safe to assume, however, that the reading should be close to the zero per cent mark before the building is declared safe for reoccupancy. McNally states in his book "Toxicology" that a human can inhale air containing 50-60 parts per million of hydrocyanic acid gas for one hour before feeling any ill effect. His references are taken from the work of R. Kobert entitled "Kompendium der Praktischem Toxicologie."

We have yet much to learn with regard to the hazards that may be encountered in fumigation work. Due to space limitations, it is impossible to go into detail in any one of the hazards mentioned. No mention has been made of those factors which may give rise to physical injury and certainly not all the hazards which may be present, due to the use of the gas, have been described. If, however, this discussion will lead to more thought and greater observance of all precautions during the conduct of fumigation, much has been accomplished.

EXPLOSIVES IN DRAINAGE WORK AND SOME SUGGESTIONS ON MODIFIED PROCEDURES TO REDUCE THE PRESENT COST

EDITOR'S NOTE:- This article gives pertinent facts on the properties of explosives and their use in ditching operations, and offers suggestions on methods to keep down the cost of dynamite for drainage work.

By L. F. Livingston, Manager,
Agricultural Extension Division,
E. I. du Pont de Nemours & Co., Inc.,
Wilmington, Delaware.

Understanding of the subject of the use of explosives in drainage work is in general inadequate, and sometimes even inaccurate. For that reason, it is the purpose here to present certain facts which will perhaps clear up the subject and bring it up to date.

First of all, and perhaps most fundamental of all is the lack of emphasis on the function of explosives. In the hands of an engineer, dynamite is primarily a working tool in the same sense as a shovel, a drag-line, or a plow. The successful use of explosives, as with any other tool, is determined by the care and expertness of the operator's handling of it, which is, in turn, largely governed by his intimate knowledge of the tool and of its potentialities.

Hardly less important is a recognition of the various types of explosives, the conditions for which each type is best adapted and the ways in which they can be combined to obtain the greatest economy in operation.

Ditch blasting requires a combination of properties in dynamites different from those usually considered desirable. High velocity and high strength are essential in order that effective blasting execution may result and that the explosive power shall be developed practically instantaneously. An additional desideratum is good water resistance, since water and wet soil are ordinarily in contact with the explosive previous to the shot.

A further essential is that the dynamite shall have a high degree of sensitiveness to propagation of the explosion. This latter requirement holds when the propagation method of ditching is used, which spaces the sticks or fractions of sticks of dynamite 18 to 24 inches apart and initiates only the first charge with a blasting cap. The concussion of the explosion of this first stick causes the successive spaced charges to detonate by influence, the explosion wave being propagated through the wet earth.

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This last requirement of a high degree of sensitiveness is exactly the opposite of the properties usually sought in high explosives, since insensitiveness to shock has been a characteristic which has directed the trend of dynamites for use in quarrying, mining, and general construction operations, where a separate blasting cap is used for each bore hole. Because of the sensitiveness requirements in ditch blasting, the high strength straight dynamites are the explosives best adapted for the purpose.

Reducing Ditching Costs

Fifty per cent straight dynamite is a favored explosive for use in ditching. The straight dynamites are designated by their nitroglycerin content; hence 50 per cent straight contains 50 per cent nitroglycerin.

As has been stated, sensitiveness is the property which makes the employment of straight dynamites essential in the propagation method of ditch blasting, and 50 per cent straight dynamite is excellent in this respect.

Under some circumstances, the propagation method is not used but, instead, a method in which each hole is detonated by a blasting cap. In such case, the high sensitiveness of straight dynamite is not necessary and a dynamite of equal speed and strength may be substituted.

Heretofore, we have recommended only Ditching Dynamite -- a 50 per cent straight -- for blasting work where the propagation method through wet soil was used. At the present time, however, this is one of the most expensive dynamites, owing to the high price of glycerin. Because of this situation, we have been spending considerable time trying to work out ways and means of lowering the explosive cost on ditch blasting work.

The studies to which reference has been made concern the replacing of a part of the Ditching Dynamite normally used with other types of more insensitive, less costly, but just as strong dynamites.

It has been found that for a post hole job requiring 20 lbs. of explosive to a hole, or load, there can be used five lbs. of Ditching Dynamite and 15 lbs. of 40 per cent or 60 per cent Ammonia Gelatin Dynamite.

When the first of a series of holes is shot, the explosion wave set in motion will detonate all the other holes, due to the sensitiveness of the Ditching Dynamite which makes up one-quarter of the load of each of the holes.

The strength of the Ammonia Gelatin Dynamite used should be determined by the type of soil to be blasted. If the soil is light, such as muck, 60 per cent strength should be used. If the work is a clean-out job and there is a good hard bottom, 40 per cent dynamite can be used.

A Suggested Blasting Procedure

Let us take another example: Should you have a ditch clean-out job wherein five feet of material is to be removed, and, ordinarily, you would use four sticks of Ditching Dynamite per hole on 18-inch centers, we believe you could

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use two sticks of Ditching Dynamite and two sticks of 40 per cent or 60 per cent Ammonia Gelatin Dynamite with good results.

The Ditching Dynamite should be placed on top because, usually, the material to be blasted is wetter and softer than at the bottom of the hole. Therefore, there is more assurance of complete propagation. It is possible to use several other types of dynamite in this replacement method. However, we would not recommend any of the Ammonia Dynamites, such as "Red Cross" Extra, because of a lack of water resistance for any length of time. The Straight Gelatins could be used, but these dynamites are not always readily available. A 50 per cent Ammonia Gelatin might be used, but, again, it is not stocked generally. The 40 per cent and 60 per cent Ammonia Gelatins are carried in practically every magazine in the country, owing to their use in construction and quarry work.

Although we have been working along the lines described, we have not done sufficient work in many types of soil to make definite recommendations. For instance, where a four-stick load is to be used in a certain type of soil, one stick of Ditching and three sticks of Gelatin may work out satisfactorily. But in another type of soil, it may require three sticks of Ditching to make propagation certain, thereby limiting the Gelatin part of the load of a hole to but one stick.

In post-hole loading, under favorable conditions, a blaster might be able to use 10 per cent Ditching and 90 per cent Gelatin. In another case, he might have to load one-half Ditching and one-half Gelatin.

Test Shots Important to Determine Loads

Engineers are accustomed to doing a certain amount of research work and adapting the knowledge attained to individual conditions in the field. Therefore, where it is necessary to make estimates or recommendations on drainage clean-out work where the soil is wet, and the size of the job warrants thorough consideration, it is suggested that several test shots be made, as it may be shown that there can be saved from 10 per cent to 22 per cent of the costs of explosives.

There is another development which it is believed will interest engineers. This is the effect of depth on the ability of Ditching Dynamite to propagate. Usually, the "rule of thumb" is one stick on 18-inch centers. However, in clear water one stick at the surface of the water will only propagate for a distance of 12 inches. At ten feet depth, one stick will propagate 10 feet. In other words, the greater the depth in clear water, the less the force is lost in the air, and the greater will be the propagation radius.

It has always been said that the softer the mud, the nearer the surface the load should be placed to get maximum excavation. In general, this is true, but the statement must be qualified, as there is a point where propagation can not be obtained. Only experience and test shots can determine the matter in some cases.

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A NEW BOOKLET THAT DESCRIBES "URAMON" -- ITS PROPERTIES AND USE IN FERTILIZER MANUFACTURE

The Ammonia Department of E. I. du Pont de Nemours & Company, Inc., has issued a new booklet entitled "Uramon"--Its Properties and Use in Fertilizer Manufacture." It deals with the use of the new 42% urea nitrogen fertilizer compound developed by du Pont, in the formulation of complete fertilizers and top-dressers. While this booklet is primarily for the fertilizer industry, it will no doubt prove of value to agronomists, soil chemists, and others interested in the manufacture and use of quality fertilizers.

The booklet, which is the standard 6" x 9" bulletin size, is divided into three main sections:

1. Properties of "Uramon"

   Among the points stressed in this section are the following: "Uramon" contains 42 per cent nitrogen, equivalent to 51 per cent ammonia. "Uramon" weighs 46 pounds per cubic foot. It has moisture-absorbing properties approximately the same as sodium nitrate. All of the guaranteed nitrogen is present as urea. One hundred pounds of "Uramon" has the equivalent acidity of 75 pounds of calcium carbonate. "Uramon" nitrogen is completely available. It is readily absorbed by seedlings and young plants. It resists the leaching action of rain to about the same degree as high-grade natural organics. "Uramon" contains no accessory elements such as sodium, sulphur, or chlorine.

2. General Rules on Formulating with "Uramon"

   This section points out that superphosphate should be thoroughly neutralized with ammonia liquor, lime, or cyanamid. In most grades, 15 pounds of sulphate of ammonia should be added per unit P_2O_5 in non-ammoniated mixtures containing "Uramon." Fifty pounds of "Uramon" may be used in most mixtures and 100 pounds or more under certain conditions, which are listed. The booklet suggests avoiding use of materials and mixtures of high moisture content.

3. Formulation with "Uramon"

   Suggested formulas are included in this section, with a brief discussion accompanying each. Included are complete fertilizers to grade, bases for use in "Uramon" mixtures, complete fertilizers from bases, concentrated mixtures, and top-dressers.

The formulas given in the booklet are, of course, suggestions. There are many others into which "Uramon" fits equally well. That being the case, the booklet states that if a fertilizer manufacturer desires information concerning specific

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formulas containing "Uramon," the fertilizer laboratories of the du Pont Company willingly offer consultant service.

A copy of the booklet will be sent to any interested person, upon request. Address E. I. du Pont de Nemours & Company, Inc., Ammonia Department, Wilmington, Delaware.
